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TECHNICAL LIBRARY
03255

LENKURT 91052

MP MASTER
MA36226

91052 TRANSMISSION TEST SET

ASSOCIATED INFORMATION

EAS-91052 Equipment Assembly Schematic Diagram

1. TECHNICAL SUMMARY

General

Application:

Used in test and alignment of 9001B PCM Channel Bank Assembly. Interfaces test equipment with optional channel unit drop circuits; two-wire or four-wire, 600-ohm or 900-ohm, E and M signaling or loop signaling. Operates with external ACVM, noise measuring set, and signal generator, but includes a 1025-Hz oscillator to supply channel test tone at reference levels of 0 dBm or -16 dBm. Used initially in 91A systems.

Installation:

Portable instrument case with removable cover. Requires patch cord connection from -48V/GND jack (tip and sleeve) on test set to external DC power.

Dimensions:

Height . . . . . 10 inches
Width . . . . . 11 inches
Depth . . . . . 8 inches
Weight (Approx.) . . . . . 8-1/2 pounds

Transmit Branch

Test Tone:

Frequency . . . . . 1025 Hz (±5 Hz)

Level . . . . . 0 dBm or -16 dBm reference level; also +5, -10, -20, -30, and -40 dB relative to reference level

Impedances:

TRANSMIT jack . . . . . 600 or 900 ohms balanced output

EXT OSC jack . . . . . 600 ohms input

DC Loop Resistance . . . . . 1500 ohms

Receive Branch

Frequency Range . . . . . 200 to 3400 Hz

Impedances:

RECEIVE jack . . . . . 600 or 900 ohms balanced input

MEASURE LEVEL jack . . . . . 600 ohms terminated

MEASURE DISTN jack . . . . . 600 ohms terminated

Insertion Loss Between Jacks:

RECEIVE to MEASURE LEVEL . . . . . 0 dB (voltage)

RECEIVE to MEASURE DISTN . . . Approximately 20-dB adjustment range

DC Loop Resistance . . . . . 1500 ohms

Controls and Adjustments

TRANSMIT ATTENUATOR (S1) . . . . . Selects output level at TRANSMIT jack relative to 0 dBm or -16 dBm.

CHANNEL UNIT TRANSMIT (S2) . . . . . Conditions transmit branch to the applicable level, impedance, and signaling mode of the selected channel unit.

CHANNEL UNIT RECEIVE (S3) . . . . . Conditions receive branch to the applicable impedance and signaling mode of the selected channel unit.

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CHANNEL UNIT RECEIVE (S3) . . . . . Conditions receive branch to the applicable impedance and signaling mode of the selected channel unit.

DISTORTION REFERENCE:

PUSH TO ADJ switch (S4) . . . . . .When pushed, bypasses 1025-Hz rejection filter in receive branch.

ADJ control (R37) . . . . . .Variable attenuator; sets reference level at MEASURE DISTN jack.

OSC GAIN (R10) . . Screwdriver-operated potentiometer; calibrates 1025-Hz oscillator output level.

Jacks

All jacks are tip-ring-sleeve telephone type which accept a 310 plug.

-48V/GND (J1) . . . . For patching external -48 VDC power to test set.

TRANSMIT (J2) . . . . For patching transmit branch output to channel unit input.

RECEIVE (J3) . . . . . For patching channel unit output to receive branch input.

EXT OSC (J4) . . . . . For patching external oscillator to transmit branch input.

MEASURE LEVEL (J5) . . . . . .For patching receive branch output to bridging ACVM in measurement of drop level.

MEASURE DISTN (J6) . . . . . .For patching receive branch output to bridging test equipment in distortion and compandor tracking tests.

Power Requirements

-48 VDC . . . . . 100 mA maximum

Environmental Conditions (Operating)

Ambient Temperature Range: . . . . . 0° to 50°C (32° to 122°F)

Maximum Relative Humidity at 40°C: 95%

Maximum Altitude: . . . . . 15,000 feet

2. CIRCUIT DESCRIPTION

2.01 The transmission test set has independent transmit and receive branches through which standard test equipment can be connected to various optional two-wire or four-wire channel unit drop circuits. The transmit branch includes a 1025-Hz test tone oscillator and the receive branch a 1025-Hz rejection filter. Because the customary test tone frequency (1000 Hz) is a submultiple of the 8-kHz sampling rate in the channel units, 1025 Hz was chosen to avoid interaction (such as beats).

Transmit Branch

2.02 The oscillator is a series-fed Hartley type using transistor Q1 in a common-collector configuration, with frequency established by the L1-C2 tank circuit. Resistor R3 and zener diode CR1 produce a 10-volt collector supply for Q1, limiting the oscillator output signal. Through isolation resistor R4, the 1025-Hz signal is coupled to common-emitter amplifier Q2. Feedback in the emitter circuit of Q2 is adjustable ±0.5 dB from nominal by the 25-turn OSC GAIN control. Harmonics in the output signal are rejected by 1025-Hz bandpass filter FL2, which includes an isolation transformer.

2.03 Test tone level is calibrated with TRANSMIT ATTENUATOR switch S1 in 0 dB position and CHANNEL UNIT TRANSMIT switch S2 turned to 2W E&M 600Ω. With a 600-ohm terminated ACVM patched into the TRANSMIT jack, the OSC GAIN control is adjusted for a meter reading of 0 dBm.

2.04 The test tone level at the TRANSMIT jack is controlled in increments by TRANSMIT ATTENUATOR switch S1. In the 0 dB position of S1, the reference level used in alignment is obtained: 0 dBm for two-wire channel units and -16 dBm for four-wire channel units. The difference in levels is produced by a 16-dB pad (resistors R30 through R35), which is inserted when the CHANNEL UNIT TRANSMIT switch is turned to 4W E&M.

2.05 In the other positions of S1, the tone is changed from the reference level by the indicated amount in dB. The +5 dB position

increases the level and is used to check limiting of the transmit signal in the channel unit. Positions that decrease the level are used in measuring distortion and checking compandor tracking.

2.06 For frequency response tests, an external signal generator may be patched into the transmit branch at the normalled-through EXT OSC jack.

2.07 In two positions of the CHANNEL UNIT TRANSMIT switch (4W E&M, 2W E&M 600Ω), the tone is applied through the 5-7 winding of transformer T1, yielding an output impedance of 600 ohms at the TRANSMIT jack. In the other four positions, the higher turns ratio through the 5-6 winding increases the impedance to 900 ohms.

2.08 Capacitor C6 provides DC isolation at the balanced output windings of transformer T1. In the ORIG LOOP position of CHANNEL UNIT TRANSMIT switch S2, a 1500-ohm DC path (holding coil) is established through T1, R28, and R29 to terminate the two-wire drop circuit of channel units that originate loop signaling. In the TERM LOOP position of S2, resistance battery and ground are applied to the two-wire drop circuit of channel units that terminate loop signaling.

Receive Branch

2.09 From RECEIVE jack J3, the output of the channel unit under test passes through transformer A2T1 to the MEASURE LEVEL jack. The transformer matches the balanced 600-ohm or 900-ohm output impedance of the channel unit to the 600-ohm test equipment. Under the control of the CHANNEL UNIT RECEIVE switch, and in the same manner as in the transmit branch, DC power feed or a DC termination (holding coil) is connected to channel units with loop signaling.

2.10 To measure channel receive levels, a bridging ACVM is patched to the MEASURE LEVEL jack. This opens the receive branch and terminates it with resistors R39 and R40. By making this termination higher than 600 ohms, the insertion loss of transformer A2T1 is compensated. Resistor R40 is factory-selected to give a 0-dB voltage reading on a bridging ACVM at the MEASURE LEVEL jack with a 0-dBm test tone applied to the RECEIVE jack.

2.11 From MEASURE LEVEL jack J5, the receive branch continues through the DISTORTION REFERENCE ADJ attenuator and 1025-Hz rejection filter FL1 to 600-ohm terminated MEASURE DISTN jack J6. The attenuator is a bridged-T type with an adjustment range of about 20 dB. Capacitor C7 provides DC isolation from external measuring equipment at jacks J5 and J6.

2.12 To check distortion on a channel, a noise measuring set is patched to the MEASURE DISTN jack. The test set is calibrated with the DISTORTION REFERENCE controls (PUSH TO ADJ pushbutton and ADJ attenuator) while the meter on the noise measuring set is reading a 1025-Hz tone sent over the channel from the far end; with the pushbutton operated to bypass the 1025-Hz rejection filter, the attenuator is adjusted to give a reference level reading on the meter. With the pushbutton released, the filter blocks the 1025-Hz tone (see figure 1) and the meter indicates relative distortion level.

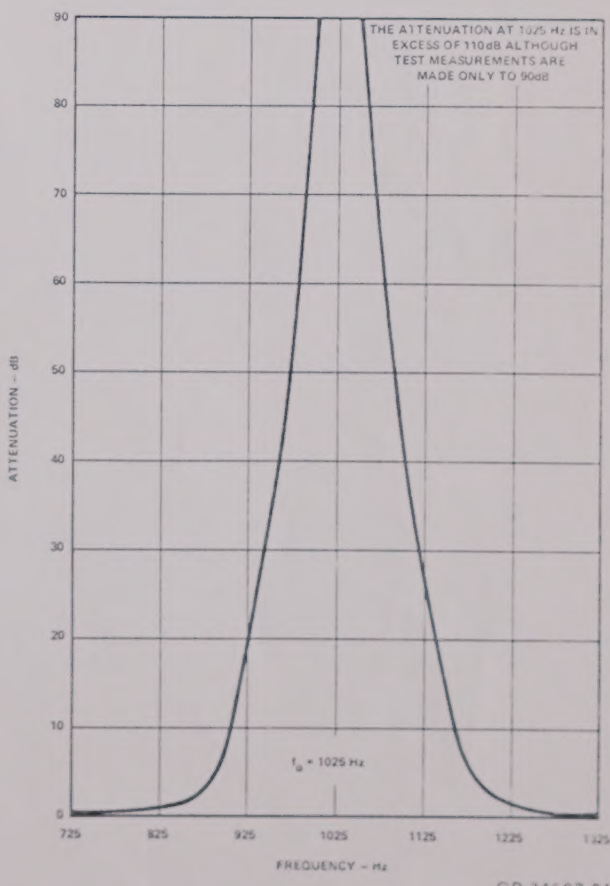


Figure 1. Frequency Response, 1025-Hz Rejection Filter

External DC Power

2.13 In the test set, external DC power is required to operate the 1025-Hz oscillator and to feed channel units that terminate loop signaling (S2 or S3 in TERM LOOP position). The DC supply circuit, patched into the -48V/GND jack J1, is protected by 1/4-ampere fuses F1 and F2 inside the test set. Diodes CR2 through CR5, in a full-wave rectifier bridge configuration, allow the DC voltage at the tip and sleeve of J1 to be of either polarity.

Test Procedure For Lenkurt
Model 91053

1. Apply power

2. Set Transmit Attenuator to 0 db. and Channel and Transmit to 2W E & M 600 ohm.

3. Patch a counter into the Transmit jack. The frequency should be 1025 H_z, $\pm$ 5 H_z.

4. Patch a DB meter into the transmit jack. Terminate the meter with 600 ohms. Also try at 900 ohm position should indicate about 1.6 DB higher with 900 ohm load.

5. Adjust Osc. gain for 0 db. reading.

6. Check +5, -10, -20, -30, -40 DB for accuracy $\pm$ 1 db.

7. Set Channel Unit Transmit to 4 w E & M. A 16 db attenuation $\pm$1 db should result on all ranges of the Transmit Attenuator.

8. Remove power from the 91052. Set Channel Unit Transmit to orig. loop.

9. Measure resistance between tip and ring of the transmit jack. The resistance should be around 1500 ohms. Also tone should come out if power applied.

10. Set Channel Unit Receive to orig. loop. Measure the resistance between tip and ring of the receive jack. The resistance should be around 1500 ohms. Should also get tone to level jack. Place jumper between Transmit and rec tracks for tone with loop

11. Remove the ohm meter and apply power to the 91052. Set Channel Unit Transmit to Term. loop. and Channel Unit Receive to Term. loop. Check for 48 volts on the tip to ring of the transmit jack and receive jack.

12. Patch the DB meter into the level jack. Patch a cord from the transmit jack to the receive jack. Remove 600 ohm load. Set Channel Unit Transmit and channel unit receive to 2w E & M 600 ohms. Levels should vary less than db from the transmit attenautor. (600n Bridging) ON ACVM

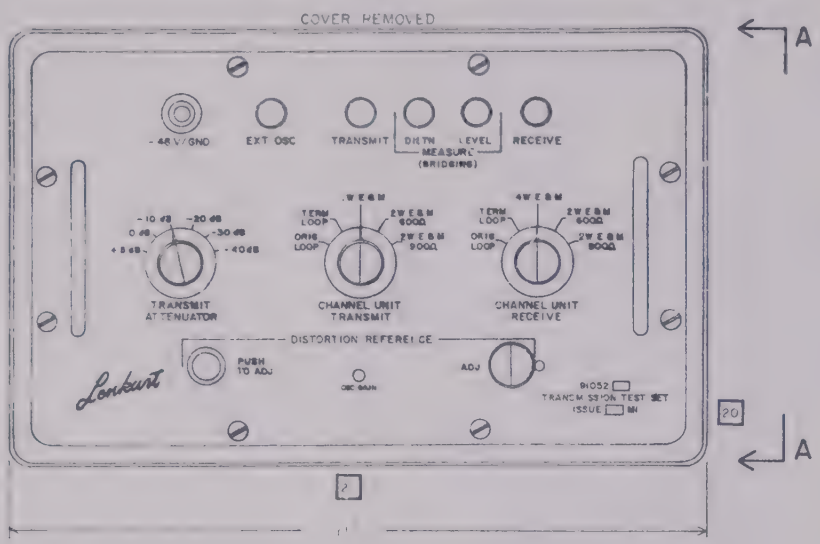
13. Set Channel Unit Transmit and channel unit receive to 4w E & M 600 ohms. All readings should drop 16 DB.

14. Return channel unit transmit and channel unit receive to 2w E & M 600 ohms.

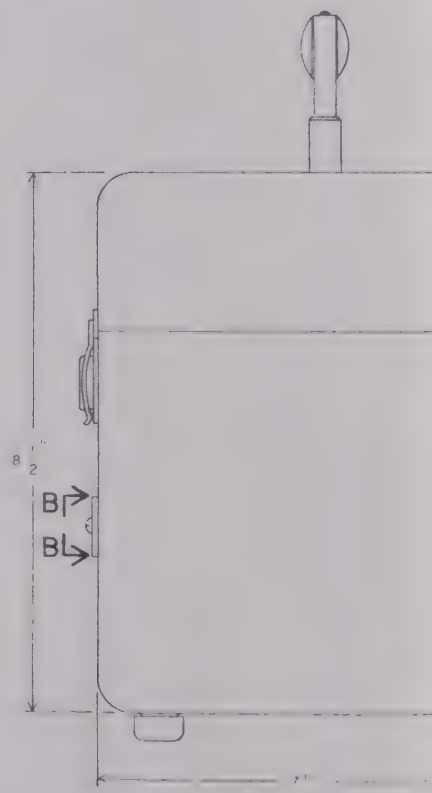
15. Remove the plug from the level jack and insert into Distn. jack. Press the Push to Adjust and set the Adj. knob to a convenient reference on the voltmeter. (Transmit attenuator may be changed to obtain this 0 DB. Release the push to adjust. The difference in meter readings will give the amount of distortion in DB. Approx. 50 DB.

FIG. 20

91052
TRANSMISSION TEST SET



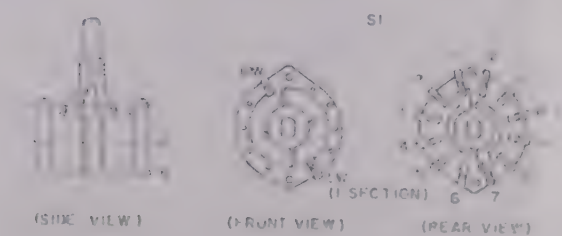
VIEW B-B



VIEW A-A

DETAIL B
JACKS

DETAIL C
SWITCHES



K DISTR L-M9P	EAS-91052-MI

REVISIONS				
SYM	ZONE	DESCRIPTION	DATE	APPROVED

TABLE B

ITEM	DESIG	COMPONENT STOCK NUMBER
	WHEN ORDERING COMPONENTS, SPECIFY UNIT TYPE NUMBER, COMPONENT DESIGNATION, AND COMPONENT STOCK NO.	
1	PASIC	
	J1	139-10665-08
	J2,J3,J6	139-10665-06
	J4	139-10665-07
	J5	139-10665-16
	R37	178-16020-02
	KNOB	126-44334-01
	S1	134-26507-02
	S2,S3	134-26507-01
	DIAL KNOBS	126-42613-01
	S4	134-44231-01
2	A1 SUBASSY	087-91052-01
	C1	056-79100-34
	C3	056-79332-34
	C4	159-25922-35
	C5	159-25922-37
	C6	056-41470-45
	C7	056-41400-45
	CR1	174-14809-27
	CR2-CR5	174-19529-12
	F1,F2	175-14721-24

	Q1,Q2	174-25566-61
	R1	161-01476-00
	R2,R14	161-01004-00
	R3	161-09093-02
	R4	161-01005-00
	R5	161-01105-00
	R6	161-01215-00
	R7	161-06193-00
	R8	161-01214-02
	R9	161-03483-00
	R11	169-43000-64
	R12,R13	161-01623-00
	R15,R16	161-04223-00
	R17	161-01474-00
	R18	161-02613-00
	R19,R25	161-05623-00
	R20,R22	161-05113-00
	R21	161-06812-00
	R24	161-01962-00
	R26	161-05115-00
	R27	161-06003-00
	R28,R29	169-43000-53
	R30,R35	161-09093-00
	R31,R34	161-09094-00
	R33	161-02154-00
	R36,R38, R43	161-06003-00
	R39	161-08253-00
3	A2 SUBASSY	087-52430-01
	C8	056-41470-45
	R10	178-38326-24
	R41,R42	169-43000-58

2N2222

NOTES:

20. ISSUE NUMBER

ISSUE NUMBER MARKED ON EQUIPMENT AGREES WITH EAS DRAWING ISSUE NUMBER AT THE TIME OF MANUFACTURE.

21. WARRANTY MARKING

THE WARRANTY MARKING NORMALLY APPEARS ON THE FRONT OF THE FACEPLATE. E.G., (WRNTY 0770) REFERS TO THE START OF THE WARRANTY PERIOD, JULY 1970.

DETAIL D
ATTENUATOR

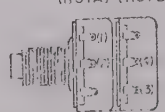
S2-S3

TYPICAL (2 SECTIONS) (REAR VIEW)

S4

(REAR VIEW)

(R37A) (R37B)



(TOP VIEW)

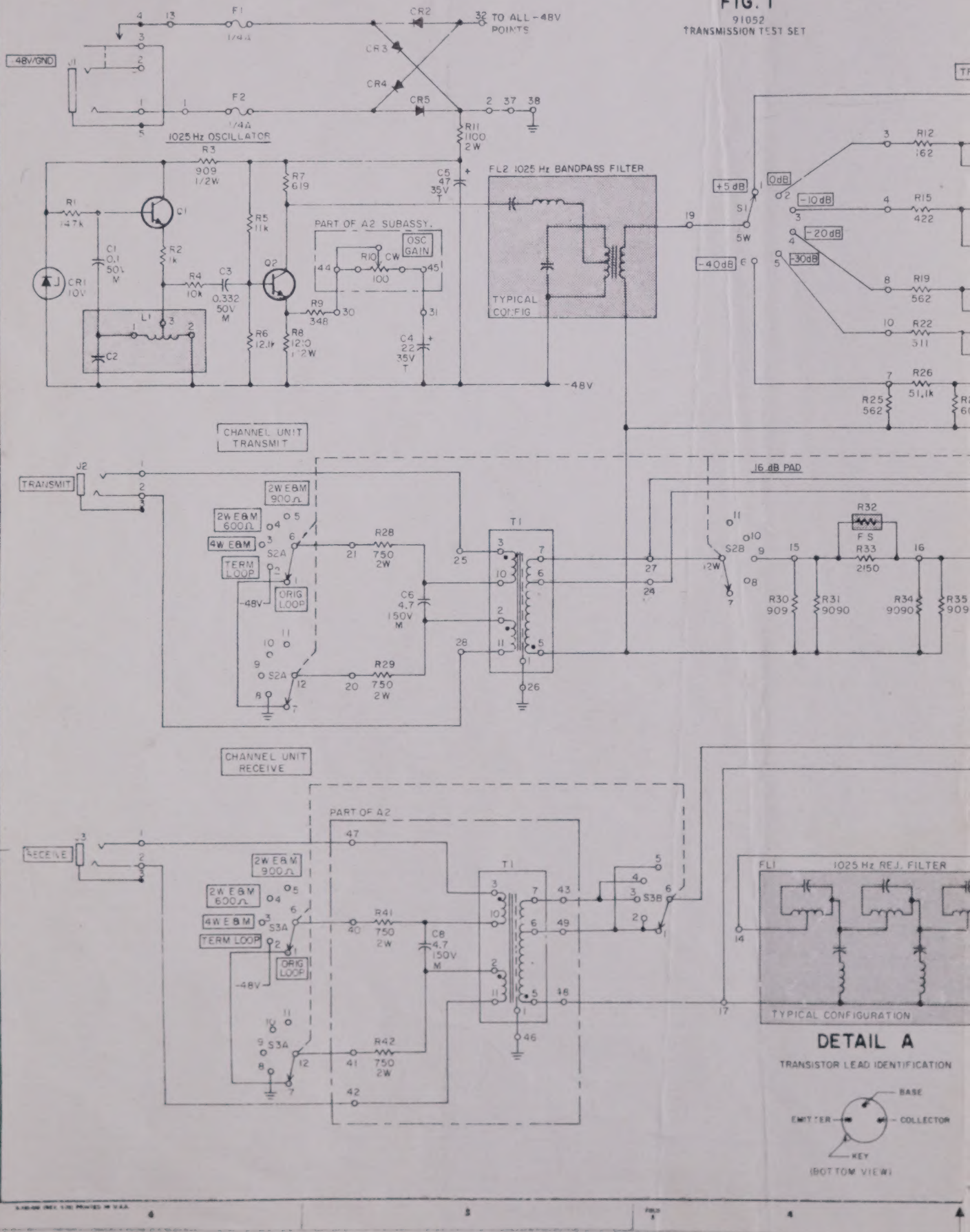
LENKURT ELECTRIC					
INITIAL USE: 90CIB		CKD	DFTG: AYN		DATE 5-4-70
			APPD: DWR		
ENGINEER R.COOK	DATE 12-5-69	APPD	STDS: CWM		5-4-70
			TRANS		
DRAFTSMAN K.HJULSTROM	4-24-70		APPD: CNR		
		DRAWING RELEASE			5-5-70

91052 MODEL 1
TRANSMISSION TEST SET

CODE IDENT NO.	SIZE	EAS-91052-MI
03744	D	DWG ISSUE: 2 SHEET 2 OF 2

FIG. 1

91052
TRANSMISSION TEST SET



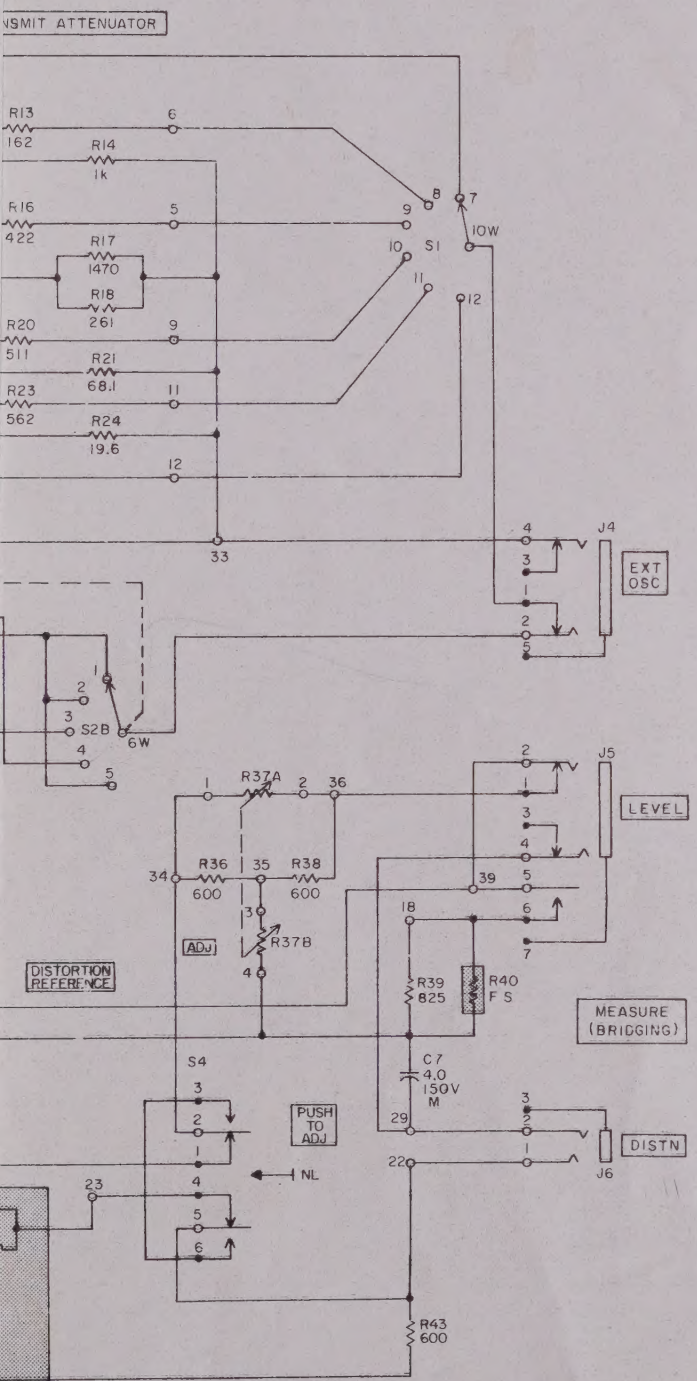
DETAIL A

TRANSISTOR LEAD IDENTIFICATION

K DISTR L-M9P	EAS-91052-MI

REVISIONS

SYM	ZONE	DESCRIPTION	DATE	APPROVED
1A		ECA 37191, CLASS E CHANGES MADE PRIOR TO FIRST SHIPMENT.	7-25-70 GMB	DWR
2		ECA 39468, CLASS B CABLE HARNESS WAS ONE CABLE & PC BOARD REVISED.	4-12 71 TJ	DR



NOTES:

1. EQUIPMENT

   EQUIPMENT FURNISHED PER TABLE A. ITEM NUMBERS IN TABLE A REFER TO ITEMS IN TABLE B.

2. RESISTORS

   ALL RESISTANCE SHOWN IN OHMS. k DENOTES THOUSAND. ALL RESISTORS ARE 1/8 WATT, 1% UNLESS OTHERWISE INDICATED.

3. CAPACITORS

   CAPACITANCE SHOWN IN MICROFARADS UNLESS OTHERWISE NOTED. ALL CAPACITORS ARE POLYSTYRENE WITH A WORKING VOLTAGE OF 100V UNLESS OTHERWISE INDICATED. M DENOTES MYLAR. T DENOTES TANTALUM.

4. COMPONENT REPLACEMENT

   ONLY THOSE COMPONENTS SHOWN IN TABLE B ARE RECOMMENDED FOR FIELD REPLACEMENT. ALL OTHER COMPONENTS ARE TO BE REPLACED ONLY AT A DESIGNATED REPAIR CENTER OR THE UNIT SHOULD BE RETURNED TO LENKURT FOR SERVICE.

5. FUNCTIONAL MARKING

   TITLE IN RECTANGULAR BOX REPRESENTS FUNCTIONAL MARKING ON EQUIPMENT.

6. SWITCHES

   ALL SWITCHES SHOWN IN POSITION 1. NUMBERS ADJACENT TO SWITCH TERMINALS REFER TO SWITCH POSITIONS. FOR SWITCH TERMINAL LOCATIONS REFER TO DETAIL C.

TABLE A

EQPT	FUNCTION	ITEM
91052-01	PROVIDES A 1025 Hz MILLIWATT SUPPLY WITH STEP ATTENUATOR (+5 TO -40 dB) AND BALANCED IMPEDANCE MATCHING TRANSFORMERS FOR TRANSMISSION MEASUREMENTS ON TWO OR FOUR WIRE CIRCUITS. PROVIDES HOLDING COIL FOR MEASUREMENTS ON 2 WIRE LOOP ORIGINATING UNITS. PROVIDES REVERSE BATTERY FOR MEASUREMENTS ON 2 WIRE LOOP TERMINATING UNITS. ALSO PROVIDES 1025 Hz REJECT FILTER TO FACILITATE DISTORTION MEASUREMENTS.	1 & 2

SYM	DESCRIPTION
FS	FS DENOTES FACTORY SELECTED COMPONENTS
	SHADED AREA DENOTES CIRCUITRY NOT RECOMMENDED FOR FIELD SERVICING
□	NUMBER OR LETTER IN SQUARE REFERS TO RELATED NOTE OR TABLE

LEGEND

LENKURT ELECTRIC

INITIAL USE: 9001B		CKD	DFTG: AYN	DATE 5-4-70
			APPL: DWR	
ENGINEER R COOK	DATE 4-24-70	APPD	STDS: CWM	5-4-70
			TRANS:	
DRAFTSMAN K.HJULSTROM			APPL: CNR	
		DRAWING RELEASE		5-5-70

91052 MODEL 1
TRANSMISSION TEST SET

CODE IDENT NO.	SIZE	EAS-91052-MI
83744	D	
DWG ISSUE: 2		SHEET 1 OF 2

ACCOPRESS®

25970	YELLOW
25971	BLACK
25972	LIGHT BLUE
25973	DARK BLUE
25974	LIGHT GRAY
25975	LIGHT GREEN
25976	DARK GREEN
25977	TANGERINE
25978	RED
25979	EXECUTIVE RED

GENUINE PRESSBOARD

ACCO USA, INC.
770 S. ACCO PLAZA
WHEELING, IL 60090

MP MASTER
MA36226